Implementing the VIPER Information-Sharing & Visualization Platform Tool

Virginia Interoperability Picture for Emergency Response

Homeland Security

This page is purposefully left blank.

Table of Contents

Note: *This document refers to vendor-specific technologies because these technologies were used most frequently in conjunction with the VIPER tool. Mentioning these technologies by name is not meant to serve as an endorsement of the specific technologies.*

Executive Summary

In an effort to make our Nation a safer place, localities and states have started to embrace collaboration and information-sharing models. In 2009, the Science and Technology Directorate (S&T) of the U.S. Department of Homeland Security (DHS) launched the Virtual USA (vUSA) initiative, which is helping to create a future where jurisdictions at all levels have the capabilities necessary to voluntarily share information with each other, as appropriate and authorized, regardless of the data format. The Virginia Department of Emergency Management (VDEM) was one of the first state agencies in the United States to implement a situational awareness tool that uses the principles on which vUSA was founded. In the Virginia Interoperability Picture for Emergency Response (VIPER), real-time situational information interacts with "traditional" Geospatial Information Systems (GIS) layers to create a comprehensive picture of current and developing situations across the Commonwealth of Virginia.

This document explains how and why VDEM developed VIPER and the steps or considerations VDEM took to ensure successful implementation, including:

- Governance, Partnerships, and Information-Sharing Agreements
- Project Management, Leadership, and Management Team
- Funding for Situational Tools
- Training, Communications, and Outreach
- Implementation and Usage

Implementation of Local VIPERs

The VIPER implementation process and governance development produced a number of lessons learned that could benefit other localities, states, and regions across the country as they work to establish their own situational awareness tools. **These lessons learned were derived from the specific needs, culture, and agencies in Virginia and should not be treated as best practices.** While many lessons learned may be applicable to other emergency management communities, some lessons learned will not be applicable. These lessons learned are incorporated within the document.

Appendix D includes additional considerations for implementing a statewide collaboration and information-sharing system from the vUSA: Approaches to Statewide Collaboration and Information Sharing document.

VIPER Background

What is VIPER

VIPER is a tool that allows the Virginia Emergency Operations Center (VEOC) to spatially display interrelated information in order to improve the situational awareness of response and recovery coordinators. VIPER is used to pull information from various systems such as WebEOC, Computer Aided Dispatch (CAD), Virginia Department of Transportation's (VDOT) 511 Traffic System, and the National Weather Service, and to display it geospatially. By doing so, real-time situational information interacts with "traditional" GIS layers to create a comprehensive picture of developing situations across the Commonwealth. Examples of this include:

- Displaying the location of hospitals around a rapidly escalating traffic incident.
- Showing the location of schools around a hazardous materials event.
- Showing the infrastructure affected by a forecasted storm surge.

LESSON LEARNED A

Use an external facilitation team to implement a situational awareness tool – The use of a facilitation team to help with the establishment of the Virginia Interoperability Picture for Emergency Response (VIPER) Working Group greatly assisted in the creation of its governance structure, and the identification of priorities. The VDEM VIPER Team, which consisted of VDEM's Director of Operation, GIS Manager, and Chief Technology Officer (CTO), was focused on the day-to-day tactical aspects of creating the tool, keeping it running, training users within Virginia, and providing code and training to other interested states and federal agencies. The use of an outside facilitator helped the team focus on the long-term and strategic initiatives, as well as the foundational elements such as the establishment of the Working Group. Additionally the impartial facilitators helped gather current requirements and prioritize current needs in a way that allowed each stakeholder to have a voice while using a transparent process.

VIPER is remarkable in that it shows the relationships between events automatically, thereby alerting the emergency operations center (EOC) to potential issues and providing real-time analysis for decision support. To promote a multi-platform model of GIS information sharing, the information in VIPER is shared with other levels of government via data links using standardized and widely accepted data standards such as GeoRSS, .xml, and map services. This approach allows agencies and localities to share information with the VEOC regardless of which GIS system they use, thereby maximizing their existing investments and minimizing future costs.

The VIPER Gameboard

Beginning in September 2009, a number of one-on-one interviews with VDEM representatives and end users, and facilitated stakeholder discussions were conducted to gather information about the need and process for situational awareness tools at the state and local level in Virginia. The intent of this work was to help VDEM create a governance structure and to document lessons learned from the process to assist S&T with its implementation of the vUSA initiative.

Figure 1 depicts the Gameboard that was created during the first facilitated session. The figure illustrates the themes that came out of the interviews and facilitated session. As localization began, each of these themes has been discussed in subsequent meetings.

The Gameboard is a useful tool for grounding teams and aligning them around the current state, future state, case for change, and potential barriers. After openly discussing these aspects, each team member walks away with a better understanding of the project. This Gameboard exercise was a useful way for the VIPER Working Group to create a foundation for working together in the future.

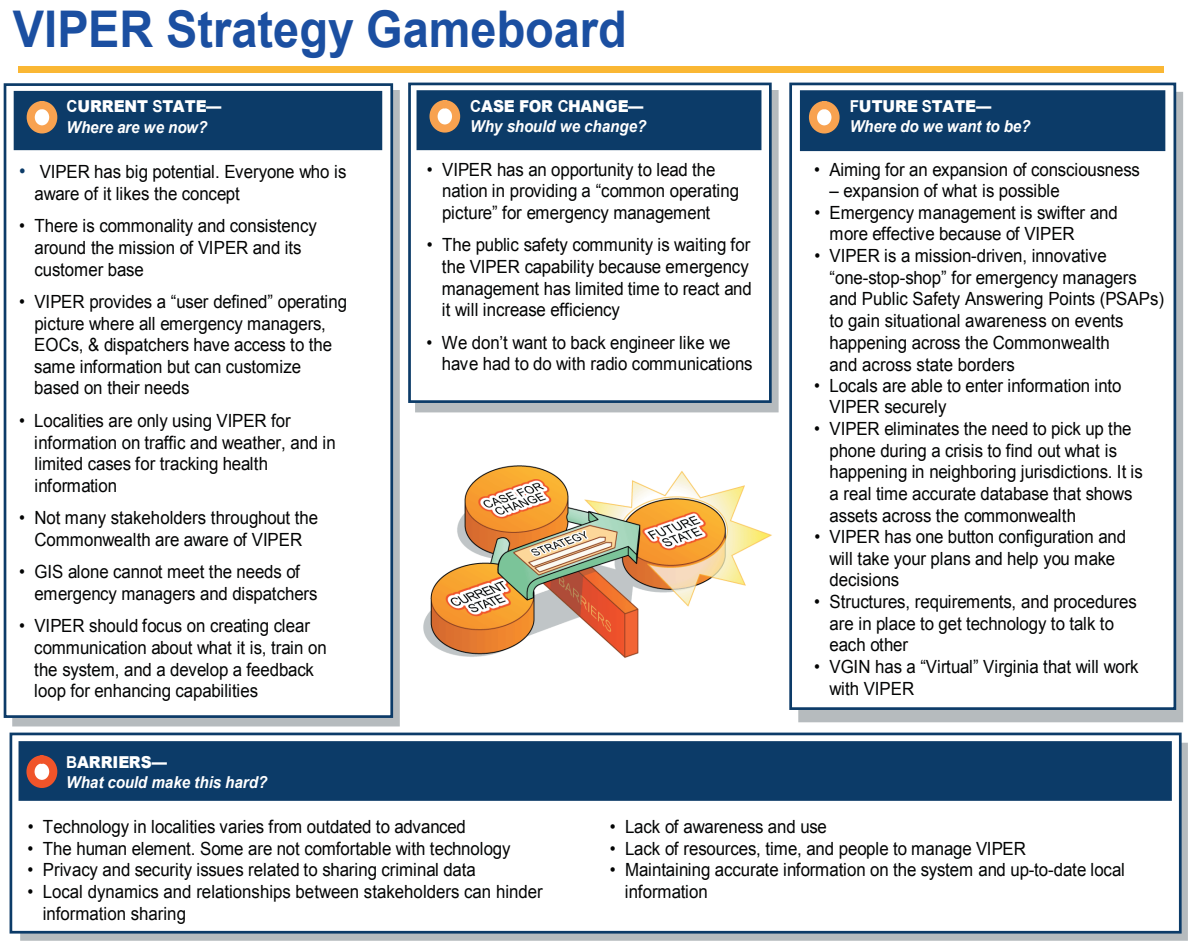

Figure 1. VIPER Strategy Gameboard

Governance, Partnerships, and Information-Sharing Agreements

VIPER depends on the cooperation and information sharing of multiple agencies and stakeholder groups. As such, the VIPER Working Group was created to ensure that the tool remained applicable and usable by the disparate state and local agencies that would benefit from it. The Working Group helps VDEM learn more about the information sharing needs of the end-user community so that it can address those needs in future updates.

The Working Group comprises representatives from state and local agencies including emergency management, 9-1-1, emergency responders, and GIS representatives. A list of participant professions is located in Appendix B.

The VIPER Working Group and VDEM do not have the authority to mandate localities or regions to share information or to adopt standard operating procedures (SOPs) or technical standards. Locality involvement and cooperation has come organically from the realization and appreciation of localities that see the benefit of VIPER to their emergency management, GIS, and emergency response needs.

LESSON LEARNED B

Establish a stakeholder forum for gathering user requirement recommendations – Recommendations from potential users of situational awareness tools provide excellent insight to the tool's managing agency. Whatever agency oversees the implementation of a situational awareness tool should incorporate the thoughts of other agencies likely to share information or request access to the tool. This allows the tool to be constructed in such a way that benefits a broad array of end users across disciplines. This approach will likely increase buy-in, participation, and information sharing needed for emergency managers to make accurate and informed decisions.

LESSON LEARNED C

Establish a User Group/Governing Body – If the situational awareness tool is 1) managed by more than one agency or organization and/or 2) funded by more than one funding source from more than one organization, a governing body comprised of representatives from each governance authority with decision-making powers may improve and facilitate the decision-making process regarding the management and strategic direction of the tool.

Governance

The VIPER Working Group operates as a stakeholder user group rather than a decision-making body because:

- VDEM is the sole organization responsible for the management and funding of the VIPER tool and thus has sole authority to make decisions about the VIPER tool.
- Working Group representatives do not have the authority to make decisions on behalf of their organizations or locality.
- VDEM has no power over localities, only coordination and administration duties as they relate to disaster mitigation, preparedness, response and recovery plans, and programs with proponent local, state, and Federal Government agencies and related groups as stated in Virginia's Emergency Services and Disaster Law § 44-146.18.

The Working Group collectively created its charter to include the following roles and responsibilities.

Roles and Responsibilities of Working Group Members

The VIPER Working Group members were assigned the following roles and responsibilities.

- Make recommendations to decision makers from each organization and VDEM as they apply to VIPER on:
  - Adopting standards.
  - Sustainability and long term use of VIPER.
  - Technological implementation.
  - Sharing operational and technological best practices.
  - Coordinating and leveraging state-wide architecture.
- Share subject matter expertise and resources.
- Identify grant funding opportunities.
- Coordinate VIPER related activities to ensure information sharing is occurring.

- Act as champions in the Commonwealth.
- Help VDEM prioritize VIPER development.
- Create a roadmap for how to develop a system of systems.

VIPER Working Group Structure

- The VIPER Working Group was designed to have two subcommittees that would focus on and integrate the expertise and needs of operational and technical personnel. However, the Working Group decided that it would officially operate as one group and would split into operational and technical sub-groups on an ad hoc basis as the need arises for specific tasks.

Role and Responsibility of VDEM

- Act as VIPER champion for the Working Group.
- Demonstrate what is possible with VIPER.
- Lead the technical development of VIPER.
- Support local agencies with state resources.
- Convene the Working Group.
- Serve as the business owner of VIPER.
- Link to vUSA.

How Working Group Members Were Chosen

- State-level participants were chosen based on their role with the state government.
- Local-level participants were chosen based on existing relationships with VDEM and interest in and need for a situational awareness tool.

Partnerships and Information-Sharing Agreements

VDEM has worked to build and maintain solid working relationships with local, state, and Federal agencies as well as hospitals and utility companies. The success of VIPER and vUSA is dependent upon the principle that each agency and locality continues to own his or her information. Without information supplied by other agencies, VIPER would be limited to only the information currently available from WebEOC. Relationships and information-sharing agreements with localities and other agencies (whether formal or informal) must exist to allow the EOC to make more informed decisions and for VIPER to provide access and useful information to the emergency management community.

Informal Agreements

VDEM has informal agreements to access publicly available information through VIPER. Informal agreements worked best when VDEM was sharing information with other government agencies.

Figure 2. Information Sharing Agreements

- VDOT: An informal agreement exists between VDOT and VDEM to share information through VIPER.
  - VDEM's operations manager planned to establish a formal agreement with VDOT, however, the agencies have continued to share information without an agreement in place.
  - VDOT provides VDEM with "special access" to pull information directly from VDOT's 511 Traffic System and databases.
  - VDOT provides advanced notice if its system plans to go down, allowing VDEM to pull its information from a back-up site as needed.

LESSON LEARNED D

Informal agreements can allow greater flexibility among public sector information sharing partners – The creation of formal information sharing agreements between government agencies have proved tedious to construct as well as oversee, and are often so substantively general that they are largely irrelevant. On the other hand, informal agreements between government agencies in Virginia have proved more effective as a means to establishing information sharing partnerships.

- This is only possible because VDEM established a personal, working relationship with VDOT.
- National Oceanic and Atmospheric Administration (NOAA): VIPER draws its weather information directly from a public feed offered on NOAA's Web site.
  - After developing personal relationships, NOAA now notifies VDEM in advance if its system plans to go down.
- Local Electric Co-ops: VDEM has begun to build partnerships with local electrical co-ops in Virginia and neighboring states through the State Corporation Commission (SCC). These partnerships will likely be finalized once security concerns are addressed.

Formal Agreements

VDEM has acknowledged that formal agreements may be beneficial and potentially required when using data provided by private entities.

Existing MOUs and Information Sharing Agreements

VDEM relies on memorandums of understanding (MOUs) and information-sharing agreements put in place by VDEM prior to VIPER's creation to access non-publicly available information in VIPER.

- Utility Companies: VDEM currently has agreements in place with Dominion Power to share information (including through VIPER) as it relates to emergency planning and response to radiological emergencies. VDEM is working with Dominion Power to potentially use VIPER to assist with these needs.
- VA Statewide Mutual Aid Agreement: The Commonwealth of Virginia has a mutual-aid agreement in place that VDEM and other state agencies as well as localities participate in. This formal agreement provides considerable value during emergencies, but took three years to develop.

LESSON LEARNED E

Formal agreements are beneficial between public and private sector information sharing partners – As mentioned above, VDEM found that informal partnerships and agreements are most useful when working with the public sector; however, when formulating partnerships with private sector partners, formal agreements are more beneficial given the complexity of the relationship. These formal agreements help address issues that may arise in cases when private entities share proprietary information with public entities.

- The Virginia Hospital and Healthcare Association (VHHA): VDEM has a formal MOU to share information between the VHHA and VDEM's EOC. No agreement was established specifically between VIPER and the VHHA; however VIPER is capable of pulling information directly from the WebEOC.
  - Information is not shared on a daily basis, but the MOU is in place and VHHA gave VDEM direct access to their data feeds to enable sharing during an actual event.
- CSX Corporation : VDEM is ready to sign an MOU with CSX to share information, especially data on hazardous material shipments by rail.

Should more formal information-sharing agreements need to be created in the future, VDEM has discussed using the vUSA's Southeast Regional Operations Platform Pilot's information-sharing agreement as a model.

Project Management and Leadership

Bringing Together the Right Components for Success

The VIPER project found considerable success by integrating expertise from varying areas of emergency management at the time of its inception. The development of VIPER relied upon continuous input and collaboration between the operations, GIS, and IT managers at VDEM. This collaboration ensured that technological solutions directly benefited the operational emergency management needs for geospatial information. The absence of any of these components could result in disjointed applications that would not meet the needs of emergency managers. In other words, the tool was designed to meet operational needs rather than operational processes being modified to fit the technological capabilities.

LESSON LEARNED F

Establish clear roles – Identify specific roles on the project management team and clearly define the roles and responsibilities for each team member.

LESSON LEARNED G

Incorporate all perspectives – Operational, technical, and GIS experts are recommended for a successful situation awareness tool implementation. Additional roles may be required based on individual project needs. One person may need to fill more than one role based on funding and staff availability.

LESSON LEARNED H

Identify a senior management champion and leader – For the implementation of the situational awareness tool, a project lead is needed to make key decisions, obtain appropriate and necessary staff, and secure financial support for the project. Ideally this leader would be at the head of the organization that manages the situational awareness tool.

Project Management

VIPER brought together the right skill sets (e.g., operations, technology, GIS) to create the tool. Currently, all members of the VIPER Team are peers that report to different managers. This flat project management style allows involved parties to provide comments and contribute as they wish.

Funding for Situational Awareness Tools

A situational awareness tool has the potential to benefit every local, state, or regional agency that has a public safety mission. Funding for the implementation of a VIPER-like system can come from almost any of the grants that support those agencies. For example, Virginia is currently pursuing grants from:

- Wireless 9-1-1 Board: Pittsylvania County received funding for the implementation of a local VIPER through the Virginia Wireless 9-1-1 Board. The technology requirements Pittsylvania intended to address through the planned situational awareness tool directly benefited the region's public safety answering point (PSAP) and could be funded by the Wireless 9-1-1 Board.
- Regional Preparedness Advisory Committees for Interoperability (RPAC-Is): Virginia has seven RPAC-Is to assist each of the Federal Emergecy Management Agency (FEMA) regions in the Commonwealth with regional planning around interoperable communications and resource sharing. The creation of situational awareness tools directly coincides with the mission of the RPAC-Is, making the tools a viable source of grant funding for localities interested in establishing a VIPER-like system.
- Specific funding through RPAC-Is includes:
  - The Interoperable Emergency Communications Grant Program provides funding for governance, planning, training, and exercises in many, but not all regions.
  - State Homeland Security Grants can also be used to support VIPER needs regionally.

LESSON LEARNED I

Identify funding as early as possible – While funding and grants are available from many sources, it is critical to identify potential funding needs early or implementation plans could be significantly delayed.

While financial support and grant funding is helpful in initiating a situational awareness tool, a lot can be done with little to no funding. VDEM used existing staff and hardware to create VIPER and continues to manage it with a very slim staff. Funding does not need to be a barrier to creating a situational awareness tool.

Training, Communications, and Outreach

Training

Creating and maintaining a training program for VDEM and other local and state agencies is a time-consuming and resource-intensive activity.

Overall Training Goal

VIPER users need to receive training on what information is available in VIPER vs. what information must be accessed from traditional outlets. Giving emergency managers the ability to access information through VIPER instead of other time-consuming outlets will save critical time.

While VIPER provides immediate access to critical information not all the information is relevant for all situations; as a result, training should be developed on a situational- and locality-specific basis. VDEM currently conducts an in-person training session called "VIPER 101." This class teaches the basics of navigating VIPER based on the specific information-sharing needs of the audience. Many people that attend VIPER classes are first time users of VIPER.

Attendees are primarily from:

- VDEM
- Fire/Police departments
- U.S. Department of Forestry

LESSON LEARNED J

Leverage existing resources -- The implementation of a situational awareness tool may not require as much funding as anticipated. Whenever possible, VDEM has tried to leverage existing resources, such as hardware, software, staff, etc. to save time and money. Due to the flexibility and open architecture of the VIPER tool, the acquisition of new technologies is not always required. Enhancements can be made to an entity's situational awareness tool by leveraging existing relationships with partners that have advanced tools, and who are willing to share their technology, tools and lessons learned. No matter the level of maturity, VIPER and other tools must continue to invest time and energy to develop and advance existing systems and tools.

Geospatial Solutions

Teaching people how to think geospatially is one of the most critical and beneficial aspects of situational awareness tool training. People can be taught how to use the tool, but they need to determine for themselves how they can use geospatial solutions to solve the problems they face in their day-to-day jobs. VDEM provides the tool and training, but agencies must decide for themselves how they want to use it.

Future of Training

VDEM would like to see VIPER training become part of standard emergency management courses within the Commonwealth. VDEM intends to develop a "train the trainer" program that would:

- Enable agencies to get their staff up to speed more quickly rather than waiting for VDEM to train them.
- Save time and money.
- Encourage collective regional approaches to information sharing through a "train the trainer" concept.
    - With VDEM's support, Pittsylvania County now has the expertise to train its users.
- Continually revisit training curriculum.
- Include tutorial, Web-based training.

LESSON LEARNED K

Integrate training for situational awareness tools into existing emergency management training curriculum – This approach enables VIPER to be seamlessly integrated into emergency management operations and will enable the VIPER team to focus on improving functionality.

Communications and Outreach

Without access to outside data, VIPER would be limited to the information VDEM currently possesses it WebEOC. This is why it is important to reach out to new agencies and encourage them to share information - this step is critical to VIPER's success.

Outreach efforts have been valuable in terms of refining the VIPER tool to improve functionality. Through person-to-person communications and demonstrations, the VIPER Team has identified new ideas and functional uses for VIPER that have helped drive VIPER's development.

While outreach efforts have served to refine the VIPER tool and provide access to greater sources of information, the VIPER Team does not have a formal outreach approach and communications are primarily conducted when external persons approach VDEM for information about VIPER.

To address the level of interest and share the tool with end users, VDEM continually demonstrates VIPER and communicates with local, state, Federal, and international emergency management user communities. These demonstrations serve to explain the benefits, uses, implementation needs, costs, and technology requirements - such as data links, data standards, and the appropriate hardware and software - associated with VIPER. VDEM has also benefited from collaborating with other states that are creating similar tools through conferences and vUSA working groups.

Communication and Outreach Challenges

While agencies that use VIPER are pleased with its capabilities, many people and agencies throughout the Commonwealth are not aware of VIPER and therefore do not use it. As VIPER continues to build upon its recent success, there will be a need to increase outreach and communication to inform, train, and obtain user feedback. This will serve to improve awareness and enhance capabilities.

LESSON LEARNED L

Outreach must occur from the top down and bottom up – It's important to obtain buy-in from both senior management and end users. If end users don't know about the system or don't understand its benefits, it will not be operationally adopted. Buy-in from senior management enables the project team to focus on implementation of the tool, and acquire necessary support for ongoing costs.

LESSON LEARNED M

Leverage existing groups to conduct outreach – By using existing emergency management and information sharing organizations (such as Virginia's Regional Preparedness Advisory Committees (RPACs)) to communicate the benefits and uses of VIPER, VDEM is able to conserve resources and use its time instead to improve and expand VIPER's capabilities.

Implementation and Usage

Data Management

Data Integrity and Reliability

The VIPER tool relies heavily upon information owned and created by other agencies. This can prove difficult as the original use and intention of the data may not be known. While VIPER's ability to access data created and maintained by other agencies is one of its greatest strengths, the lack of information about the data VIPER uses (often in the form of metadata) has proved difficult.

- This can be attributed to the existence of different sets of similar data, and the need for someone to determine which data should be used in the system.

Building Relationships with Data Owners

VDEM has found that building relationships with the agencies and personnel that own data viewed in VIPER could be very useful. By establishing clear lanes of communication, VDEM hopes to work with data owners to improve its data so that it has additional or more appropriate uses.

Navigating VIPER

VIPER has become increasingly difficult to navigate as more information becomes accessible. VIPER users found that while the tool was incredibly helpful for emergency management, it was often not used to its full potential because the users did not know what relevant information was available in VIPER, or what information they need to be displayed for each type of incident.

Developing Hazard-Specific Criteria

VIPER provides access to vast amounts of information, however only some of that information is needed in each type of incident or "hazard" (Virginia has identified 59 specific hazards). As such, VDEM has begun creating Hazard Specific Picture Development (HSPD), which will allow VIPER to automatically access relevant information based upon predetermined needs for specific hazards. This function will:

- Automatically display information relevant for a particular type of hazard.
- Allow other information not standardized for a particular hazard to be accessible.
- Provide localities the ability to customize the "relevant" information that is automatically accessible during each hazard based on the needs of their locality.

To develop the HSPD, the VIPER Team is working with operational personnel to identify the specific information emergency managers typically needed during a specific hazard. The VIPER Team will add a capability for VIPER users to select a hazard and thus all the relevant information typically needed for that hazard.

LESSON LEARNED N

Focus on accessing only the information that is relevant - Localities should focus on identifying the information they need, and build relationships with the agencies necessary to access that information. Any governance agreements established to share information should focus on the big picture so as not to restrict the collaborative environment.

LESSON LEARNED O

The information owner is accountable for the information – Data providers and owners must always be empowered to keep ownership and maintain the accuracy of their information. This ensures an information-sharing environment rich with authoritative data.

LESSON LEARNED P

Create hazard-specific criteria – To simplify the navigation of a situational awareness tool, specific information should be identified and automatically accessed based on requirements pre-identified by emergency managers. The type and source of information required may vary depending on the location of the hazard. The ability to draw in additional information as needed should remain flexible.

Standards

Technical Standards

- Interoperability is necessary between differing systems such as CAD, VIPER, and EOC systems so information can flow back and forth between agencies.
- An ideal future would involve:
  - Standards-based, open-source technology that seamlessly allows for the transfer of data.
  - Standardizing how we refer to specific layers, hazards, and symbology.
  - Standardizing the metadata so everyone using the data knows exactly what data they're getting and how they can use it.
  - Standardizing the description of the source data to include: what is the source, how often and at what speed is it refreshed, how is it published?

LESSON LEARNED Q

Open standards are the key – Situational awareness tools coupled with standards would significantly reduce the amount of funding needed for geospatial information sharing because standards would enable seamless information sharing across different tools and disparate information sharing environments and platforms.

LESSON LEARNED R

Create hazard-specific criteria – To simplify the navigation of a situational awareness tool, specific information should be identified and automatically accessed based on requirements pre-identified by emergency managers. The type and source of information required may vary depending on the location of the hazard. The ability to draw in additional information as needed should remain flexible.

Operational Standards

- VIPER does not currently have standardized SOPs because each agency and user uses VIPER in a different way to support current operations. VIPER provides a user-defined operating picture unique to the specific needs of each user. VDEM does not intend to tell these users how they should use VIPER; instead, they want each user to identify their individual operational needs and work with VDEM to determine how VIPER can support those needs.
  - The training program for VIPER is the only SOP in place and the user manual (currently in development) will serve as a resource to help users navigate the tool and discover new ways VIPER can support their operations.

Security Concerns

Data security has been a major concern for local and state agencies interested in using VIPER. As of January 2010, over 22 foreign countries (including Iran) and countless local and state agencies around the U.S. had the ability to view VIPER. This is a serious concern, considering that most of the agencies interested in using VIPER have reservations about sharing information with other agencies in their region or locality. To address the security concerns of sharing information through VIPER, VDEM created role-based logins. Those with basic login permissions will only have access to information that is open source and available to the public. Any proprietary or sensitive information shared in VIPER will only be accessible by individuals and agencies designated by the data owner. For example:

- Pittsylvania County views its CAD information, which contains information sensitive to law enforcement, in VIPER. This information is only viewable by the VIPER Administrators at VDEM and appropriate persons from Pittsylvania County. In the event of an emergency, VDEM can create specific permissions based on a request from the Sheriff of Pittsylvania County to allow additional persons to access and view this information.
- The Virginia National Guard is working with VDEM to view sensitive information in VIPER. VDEM will create permissions that allow only persons and agencies identified by the Virginia National Guard to access this sensitive information.

LESSON LEARNED S

Overarching Standard Operating Procedures (SOPs) may not be applicable to all users – Each locality and agency operates under its own SOPs as well as their own user-defined operating platform. The tool "owner" may offer training or a user's guide, but does not necessarily need to standardize the way people use the tool. Individual agencies may develop their own SOPs for using the tool as appropriate.

LESSON LEARNED T

Restrict or screen access to the situational awareness tool – Localities and data providers must be assured that the information they share will remain secure and not be used for malfeasance. As such, on February 1, 2010, VDEM instituted security upgrades to VIPER that required all entities accessing VIPER to be vetted through a screening process.

Cultural Barriers

Every agency and locality has specific cultural traits and sensitivities that can hinder the role out of situational awareness tools. The following barriers were encountered in Virginia:

- Decision makers are not always comfortable using technology, and the personnel, resources, time, and technological capabilities of localities vary considerably.
- Relationships between stakeholders, privacy, and security issues may prevent information sharing, while a lack of awareness and less than accurate information management could limit use.
- Not all decision makers or emergency managers appreciate the value of GIS information. There is a cultural shift from "making a map" to "making decisions" when it comes to GIS, but this view is not yet pervasive.
- Many agencies have an aversion to sharing their information through external agencies.

Implementation of Local VIPERs

The Need for VIPER Capabilities at the Local Level

Localities have come to appreciate the great potential that VIPER has to augment the planning and operational capabilities of emergency managers, EOCs, and dispatchers. However, each locality has specific technological capabilities, operational needs/processes, and geospatial information that it uses to plan and respond to events.

To provide localities with a customized situational awareness tool to address their specific needs, VDEM initially thought the regions across Virginia should each establish their own regional information-sharing solution. However, VDEM realized that not every locality has a need for its own VIPER-like system. For others, the cost of implementation and upkeep may outweigh the system's usefulness. VDEM identified three potential solutions to provide localities across Virginia with various options for obtaining and sharing information geospatially.

Three Possible Options

Outlined below are the three potential options for information sharing solutions. Each of these options can be provided at no cost to the locality, though additional resources may be required for option three if existing hardware is not available.

1. Obtain a VIPER account and look at the state view.
2. Create a profile for the locality so that when they log into the VDEM VIPER they will see a region-specific view.

   i. Pro: No costs for region, provides a more custom view.

   ii. Con: All modifications to the view or accessible data must go through VDEM, which may take time. VDEM may not have the re sources to provide immediate technical support if needed.

3. The region hosts its own VIPER with source code from VIPER. The VIPER code does not require a vendor-specific platform (e.g., Arc GIS, Google Earth).

   i. This can cost very little if they have existing resources, or a lot if they don't already have the resources.

   ii. Pro: The region can tailor the system to their specific needs. They can be as complex as they need.

   iii. Con: Need to have the technical and personnel resources to establish and maintain the system.

LESSON LEARNED U

Allow local implementation to occur within existing frameworks – Localities are the owners and operators of most data. As such, they will have their own individual needs for situational awareness tools.

- Focus on getting existing agencies to use and contribute to the state situational awareness tool. Localities can decide if they want to develop their own tool specific to their needs or in conjunction with other localities in their region.
- As localities find greater use for situational awareness tools, they become data contributors, eliminating the need for a state agency to act as the data collector.
- To improve information sharing with localities, standards are needed for:
  - Symbology
  - Transmission of information
  - Terminology
  - Metadata
  - Common data language

What is Needed for the Creation of Local VIPERs?

As VDEM developed VIPER at the state level, it found several ingredients necessary for success, including but not limited to:

- Appropriate hardware and software
- Involved information technology, geospatial, and emergency management staff
- Support from leadership of the political unit or managing agency
- Existing business processes for sharing information across agency/jurisdiction
- Outreach to the community to communicate the benefits and uses of the tool

The VIPER team worked with interested localities/regions to evaluate each of these components prior to standing up such a system. If the components above are considered suitable for maintaining a situational awareness tool, then VDEM will provide support in a priority fashion. Appendix C contains an outline of considerations that VDEM created for local, state, or regional agencies to use prior to creating their own situational awareness tool.

VDEM Support to Localities

Following a positive evaluation of a locality's technical capabilities and staffing resources, the VIPER team worked with the locality/region on an as available basis to help them develop their own system.

VDEM Support was Limited to Providing:

- The VIPER code for localities to customize for their specific needs.
- Lessons learned and best practices as they relate to business practices and technical requirements.
- Advice on how to stand up a situational awareness tool based on VDEM's experience.

Current State of Local Implementation

VDEM started providing information on how to create a local version of VIPER to the following localities because of locally specific interest. As of August 2010, the localities had made the following progress.

Locality	Status Of Local Situational Awareness Tools		
	Started the Process	Implementation in Progress	Fully Functional
Pittsylvania			VDEM assisted with the implementation of a VIPER-like tool Implementation was completed in three days Locality needs to identify the information it needs to view in the tool before the tool can provide value in emergency management operations
Henrico	Locality has identified the technological upgrades needed to support a situational awareness tool		
Chesapeake	Support from local decision makers has been acquired, but implementation has not yet begun		
Rockbridge	Local EOC has contacted VDEM		
Albermarle County	Local EOC has contacted VDEM		
Virginia Beach	Local EOC has contacted VDEM		
Washington County	Local assessment conducted in June		

Conclusion

VIPER started based on a true emergency management need and a desire to provide emergency managers with more accurate information faster. After VDEM created the first prototype of VIPER, many additional needs and uses became apparent across the state. As with any new product or service, the design and implementation of VIPER required several activities that were dependent or worked in parallel with one another. This report highlights some of those activities so that other states may build off Virginia's experience.

Activities and issues that were addressed during the design and implementation of VIPER:

- Project Management
- Governance
- Partnerships
- User Working Group
- Funding
- Cultural Barriers
- Communication And Outreach
- Training
- Security
- Different Options For Using The Tool
- Data Management
- Standards

For additional information please contact:

VDEM Staff

Bobbie Atristain – Director of IT– bobbie.atristain@vdem.virginia.gov

Harry Colestock – Director of Operations – harry.colestock@vdem.virginia.gov

Brian Crumpler – GIS Manager – brian.crumpler@vdem.virginia.gov

Science and Technology Directorate

S&T POC – virtualusa@dhs.gov

Appendix A: Lessons Learned from the Virginia Department of Emergency Management

This document provides the reader with a succinct snapshot of the lessons learned from the Virginia Department of Emergency Management (VDEM) around planning, implementation, and management aspects of their situational awareness tool. For more information please reference the Case Study: Implementing a Situational Awareness Tool, from which these lessons learned were extracted.

Governance, Partnerships, Information-Sharing Agreements

Lesson Learned A: Use an external facilitation team to implement a situational awareness tool – The use of a facilitation team to help with the establishment of the Virginia Interoperability Picture for Emergency Response (VIPER) Working Group greatly assisted in the creation of its governance structure, and the identification of priorities. The VDEM VIPER Team, which consisted of VDEM's Director of Operation, GIS Manager, and Chief Technology Officer (CTO), was focused on the day-to-day tactical aspects of creating the tool, keeping it running, training users within Virginia, and providing code and training to other interested states and federal agencies. The use of an outside facilitator helped the team focus on the long-term and strategic initiatives, as well as the foundational elements such as the establishment of the Working Group. Additionally the impartial facilitators helped gather current requirements and prioritize current needs in a way that allowed each stakeholder to have a voice while using a transparent process.

Lesson Learned B: Establish a stakeholder forum for gathering user requirement recommendations – Recommendations from potential users of situational awareness tools provide excellent insight to the tool's managing agency. Whatever agency oversees the implementation of a situational awareness tool should incorporate the thoughts of other agencies likely to share information or request access to the tool. This allows the tool to be constructed in such a way that benefits a broad array of end users across disciplines. This approach will likely increase buy-in, participation, and information sharing needed for emergency managers to make accurate and informed decisions.

Lesson Learned C: Establish a User Group/Governing Body – If the situational awareness tool is 1) managed by more than one agency or organization and/or 2) funded by more than one funding source from more than one organization, a governing body comprised of representatives from each governance authority with decision-making powers may improve and facilitate the decision-making process regarding the management and strategic direction of the tool.

Lesson Learned D: Informal agreements can allow greater flexibility among public sector information sharing partners – The creation of formal information sharing agreements between government agencies have proved tedious to construct as well as oversee, and are often so substantively general that they are largely irrelevant. On the other hand, informal agreements between government agencies in Virginia have proved more effective as a means to establishing information sharing partnerships.

Lesson Learned E: Formal agreements are beneficial between public and private sector information sharing partners – As mentioned above, VDEM found that informal partnerships and agreements are most useful when working with the public sector; however, when formulating partnerships with private sector partners, formal agreements are more beneficial given the complexity of the relationship. These formal agreements help address issues that may arise in cases when private entities share proprietary information with public entities.

Project Management and Leadership

Lesson Learned F: Establish clear roles – Identify specific roles on the project management team and clearly define the roles and responsibilities for each team member.

Lesson Learned G: Incorporate all perspectives – Operational, technical, and GIS experts are recommended for a successful situation awareness tool implementation. Additional roles may be required based on individual project needs. One person may need to fill more than one role based on funding and staff availability.

Lesson Learned H: Identify a senior management champion and leader – For the implementation of the situational awareness tool, a project lead is needed to make key decisions, obtain appropriate and necessary staff, and secure financial support for the project. Ideally this leader would be at the head of the organization that manages the situational awareness tool.

Funding For Situational Awareness Tools

Lesson Learned I: Identify funding as early as possible – While funding and grants are available from many sources, it is critical to identify potential funding needs early or implementation plans could be significantly delayed.

Lesson Learned J: Leverage existing resources -- The implementation of a situational awareness tool may not require as much funding as anticipated. Whenever possible, VDEM has tried to leverage existing resources, such as hardware, software, staff, etc. to save time and money. Due to the flexibility and open architecture of the VIPER tool, the acquisition of new technologies is not always required. Enhancements can be made to an entity's situational awareness tool by leveraging existing relationships with partners that have advanced tools, and who are willing to share their technology, tools and lessons learned. No matter the level of maturity, VIPER and other tools must continue to invest time and energy to develop and advance existing systems and tools.

Training, Communications, and Outreach

Lesson Learned K: Integrate training for situational awareness tools into existing emergency management training curriculum – This approach enables VIPER to be seamlessly integrated into emergency management operations and will enable the VIPER team to focus on improving functionality.

Lesson Learned L: Outreach must occur from the top down and bottom up – It's important to obtain buy-in from both senior management and end users. If end users don't know about the system or don't understand its benefits, it will not be operationally adopted. Buy-in from senior management enables the project team to focus on implementation of the tool, and acquire necessary support for ongoing costs.

Lesson Learned M: Leverage existing groups to conduct outreach – By using existing emergency management and information sharing organizations (such as Virginia's Regional Preparedness Advisory Committees (RPACs)) to communicate the benefits and uses of VIPER, VDEM is able to conserve resources and use its time instead to improve and expand VIPER's capabilities.

Implementation and Usage

Lesson Learned N: Focus on accessing only the information that is relevant - Localities should focus on identifying the information they need, and build relationships with the agencies necessary to access that information. Any governance agreements established to share information should focus on the big picture so as not to restrict the collaborative environment.

Lesson Learned O: The information owner is accountable for the information – Data providers and owners must always be empowered to keep ownership and maintain the accuracy of their information. This ensures an information-sharing environment rich with authoritative data.

Lesson Learned P: Create hazard-specific criteria – To simplify the navigation of a situational awareness tool, specific information should be identified and automatically accessed based on requirements pre-identified by emergency managers. The type and source of information required may vary depending on the location of the hazard. The ability to draw in additional information as needed should remain flexible.

Lesson Learned Q: Open standards are the key – Situational awareness tools coupled with standards would significantly reduce the amount of funding needed for geospatial information sharing because standards would enable seamless information sharing across different tools and disparate information sharing environments and platforms.

Lesson Learned R: It may not be realistic to standardize everything – If adherence to standards is too rigid it may reduce adoption of the tool or limit possible uses. Keeping the system flexible will allow users to create more complex solutions.

Lesson Learned S: Overarching Standard Operating Procedures (SOPs) may not be applicable to all users – Each locality and agency operates under its own SOPs as well as their own user-defined operating platform. The tool "owner" may offer training or a user's guide, but does not necessarily need to standardize the way people use the tool. Individual agencies may develop their own SOPs for using the tool as appropriate.

Lesson Learned T: Restrict or screen access to the situational awareness tool – Localities and data providers must be assured that the information they share will remain secure and not be used for malfeasance. As such, on February 1, 2010, VDEM instituted security upgrades to VIPER that required all entities accessing VIPER to be vetted through a screening process.

Implementation of Local VIPERs

Lesson Learned U: Allow local implementation to occur within existing frameworks – Localities are the owners and operators of most data. As such, they will have their own individual needs for situational awareness tools.

Focus on getting existing agencies to use and contribute to the state situational awareness tool. Localities can decide if they want to develop their own tool specific to their needs or in conjunction with other localities in their region.

As localities find greater use for situational awareness tools, they become data contributors, eliminating the need for a state agency to act as the data collector.

To improve information sharing with localities, standards are needed for:

- Symbology
- Transmission of information
- Terminology
- Metadata
- Common data language

Appendix B: Agencies and Roles Invited to Participate in VIPER Working Group

	Participant Description	Number of Invited Participants
Operational Users	Emergency Manager/Coordinator	13
	911 Dispatch/Coordinator	4
	County Manager/Planner	0
	Law Enforcement/Fire/EMS	2
	Virginia State Police	1
	Dept of Conservation/Fisheries	0
	Utilities	0
	Information Technology	6
	GIS	10
	Interoperability	6
	Emergency Operations	5
	CAD Operators	1
	National Guard	1
	Political Support	2
Virginia Homeland Security Regions	Region 1	13
	Region 2	6
	Region 3	4
	Region 4	2
	Region 5	3
	Region 6	5
	Region 7	4
Technical Input	Virginia Dept of Transportation	0
	Virginia Geographic Information Network	1
	Local GIS	6
	National Weather Service	2
	Virginia State Police	1
	Critical Infrastructure	1

Appendix C: Situational Awareness Tool Implementation Considerations – Developed by VDEM

When deciding whether or not to implement a situational awareness tool, a locality should take into consideration its unique needs and capabilities. The following list represents a high-level approach to examining what might be needed to stand up a situational awareness tool, and whether or not having a localized instance of the tool is truly necessary. These points should be considered objectively, and the pros and cons should always be carefully weighed when deciding whether or not to proceed with an implementation.

- Assess what information is actually needed and how it is pertinent to current and envisioned processes. Is the information found in the public VIPER sufficient, or is it necessary to stand up a localized instance to obtain the needed data?
- It is very important to have organizational, financial, and technical support for the project from the top down.
- Is there existing hardware that will run the applications? Is the network ready to support Web applications? How is security handled for Web applications?
- Is the appropriate funding available to handle the implementation and any future support?
- Is funding available to purchase the required equipment and software?
- Does the agency have the necessary skill set (e.g., GIS, IT) to implement the project? If not, is there money available to pay for development/installation hours?
- What is the urgency level in regards to implementation?
- What type of data needs to be displayed?
- How will training be handled?
- Does the agency have project management procedures in place to handle this type of implementation?
- How will the agency apply the tool to handling hazard-specific incidents?

Appendix D: Considerations for Implementing a Statewide Collaboration and Information Sharing System

This section is taken directly from the Virtual USA: Approaches to Statewide Collaboration and Information Sharing document. The section describes the fundamental lessons learned in implementing vUSA principles in Alabama and Virginia. They are included here as best practices to be considered by other states who wish to implement similar projects. These themes have been distilled from interviews with end users and program managers associated with either Virtual Alabama or VIPER. While this is not a complete list of the steps required to begin such a project, nor are they in a particular order, each area should be considered when establishing an information-sharing project. These best practices help project managers identify the criteria necessary for their project to be successful. The criteria will vary slightly for each project and the order in which they should be addressed will also vary. The best practices below are divided into categories, which are highlighted in bold text, followed by a high-level summary of each category, and conclude with more specific best practices in a bulleted list.

> "Technology shouldn't drive business requirements; it should be the other way around."
>
> - VIPER Program Management

Identify Requirements

Identifying the information-sharing requirements of targeted end users will save time, effort, and money throughout the project. The following are key pointers to bear in mind when developing requirements:

- Coordinate with end users to identify requirements for information sharing during emergencies and day-to-day operations.
- Prioritize requirements and determine which ones need to be addressed immediately.
- Determine what information-sharing platform will best meet the end-user needs for information sharing.
- Create a project roadmap to implement the prioritized end-user requirements.
    - Identify the project's purpose, scope, and targeted end users.

Obtain Support from Senior Management (Sponsorship)

Management support of the project shows end users and other involved parties that the project has a solid foundation and implies a high probability of success. Obtaining management support early in the project allows the project team to focus their time on implementation rather than obtaining buy-in from management.

- Identify senior management support and champions for the effort.
    - Governor support of Virtual Alabama and VIPER enabled the project teams to obtain buy-in from local and state end users more quickly; however, local and state efforts can be equally successful with other levels of management support.
- Outline a clear need or business case for the project that can be communicated to end users and management.
    - Tailor presentations to each audience to provide education about the technology at a high level and to identify potential ways it can positively impact them.
        - Project managers often have one opportunity to communicate the value of their project to management and other stakeholders – tailoring each presentation will best leverage this opportunity.
        - E.g., when presenting capabilities to a fire chief, highlight the location of fire hydrants, the ability to obtain and display three-dimensional floor plans of buildings, and the ability to share up-to-date evacuation routes.

Obtain End-User Participation

End-user involvement and meeting end-user needs constitute key factors in the successful dissemination of the information-sharing project across a state. Alabama and Virginia used two different approaches to obtain end-user participation. Alabama built a prototype system using publicly available data so it could show end users how the system operates and the potential benefits of sharing their own data through Virtual Alabama. Virginia built the first version of VIPER based on existing data used by the state EOC. Once VIPER was built, the project team shared it with regional and local EOCs to encourage their use and participation and to highlight how it could improve their mission.

> "If you don't have the locals you have nothing. Keep listening to their needs or you build something that's not useful."
>
> - VIPER Program Management

- Do not impose business process on locals or disrupt existing operations.
- Do not impose the system and methodology on locals.
  - Provide the capability and let them decide if they want to use it.
- If possible, provide early access to the system so end users become comfortable and can help identify potential uses.
- Ensure the system is free to access for end users.
  - Participation is easier to obtain when users can access the system and share information without incurring fees for access.

Communicate Benefits with Potential End Users

The emergency response community will be more interested in participating in the project and sharing information if they have a clear understanding of how the project will benefit them and improve their mission. By demonstrating a prototype or live version of the system and presenting the benefits to potential end users using various forums (e.g., conferences, Web meetings), the emergency response community will likely embrace the concept and begin using the system.

> "Familiarity brings endorsement and acceptance."
>
> - Virtual Alabama End User

- Create a strategy for engaging with local stakeholders.
  - Continuous communication is key.
    - Do not show up once and expect them to use it.
  - Create a timeline of meetings and conferences.
    - Virtual conferencing technologies such as WebEx and GoToMeeting allow people to meet virtually, saving travel time and money
- Demonstrate your information-sharing platform to potential end users.
  - Demonstrations spark interest and generate ideas for local use.
  - Live data makes demonstrations more effective.
  - Research the needs and challenges facing the intended audience and illustrate how the project will help meet those needs and resolve the challenges.
    - E.g., Management-level users will appreciate that they can have an immediate situational awareness of an incident anywhere they have Web access. Emergency managers will appreciate the real-time access to traffic cameras, weather information, and location of resources and infrastructure all in one place to help them make quicker decisions during a critical incident.

- Show potential end users the realm of the possible and let them know that the project team will do their best to meet the information-sharing needs identified by the user community.

Establish Governance

A solid governance structure is vital to the continued success and sustainability of the statewide information-sharing system. The system (and the implementation project for the system) must have the commitment and support from relevant staff, end users, and volunteers.

- Create a working group or governance structure that will move the project forward.
  - Include end users, program managers, and technical staff.
  - Define the scope of the effort, and create a charter and standard operating procedures.
  - The working group should meet on a regular basis.
- Establish MOUs among project participants.
  - Address MOUs sooner rather than later as it can be a time-consuming process.
    - It would be helpful to have a staff person dedicated to this effort at the beginning of the governance-building phase.

Ensure Local Control and Decision Making

Local control of data is one of the most important factors involved in a successful statewide information-sharing project. Local control provides users with the assurance that no one else can manipulate their data or view it without their permission.

- Locals should own (host), control, and maintain their data.
  - They decide what they will share and with whom.
  - Data should reside at database owner's location.

Identify Funding Mechanisms

Virtual Alabama and VIPER are using a business model that enables end users to share information for free. While access to the systems is free for end users, the costs are absorbed at the state level, which means a funding source must be identified by the state.

- Identify a funding mechanism for the effort.
  - Start-up costs are generally low, but funding is necessary for servers, staff, and ongoing maintenance.
  - Use grant funds for start-up costs, but sustainable funding is required for ongoing maintenance and support.

Train the Participants

Training end users on the information-sharing system provides direct involvement with the solution and allows users to identify new ways they can use the system to improve their mission. Because most people learn more easily through hands-on practice, in-person training is ideal. If in-person training is not feasible, training can also be provided using Web meetings or through Web-based training modules.

- Develop a training curriculum early in the project.
  - Creating a training curriculum early will save time for the project team as more people begin using the system and the team loses the bandwidth to conduct individual training sessions.

- Allocate time and funding to support training.
  - This will save time when the system is in high-function mode and numerous new end users need training.
- Consider a combination of in-person and Web-based training.
  - In-person training helps answer questions and fosters better communication.
  - Web-based training allows for continuous training accessibility.
    - Efficient for areas that may be difficult to access.
    - Provides a method to quickly deploy training updates and refreshers.
    - Provides the ability to simultaneously train a large number of end users.

Provide Support Services

Because the initiation and maintenance of a statewide information-sharing project is labor intensive, staff should be identified and allocated to focus on the project.

- Allocate staff for project management, technical development, training, and outreach to locals.
  - Example roles include GIS specialist, operational program manager, technical program manager, and a liaison with end users to coordinate outreach and training.
- Provide an open forum for end users to share information with each other.
- Provide a means for end users to give feedback to the project team.

Use Common Formats

Common formats, or standards, enable data to be exchanged seamlessly across different information-sharing systems. Common formats include a shared understanding of terminologies, technical standards, and standard operating procedures.

- Determine the best platform that will meet the information-sharing needs of the end users.
- Use common feeds and formats.
- Adopt non-proprietary standards.

> "If data isn't formatted in a way we can use, we have to do heavy lifting to get it to work. It's not a show-stopper, but there's a lot to do in the middle. There's a whole industry to create middleware to translate data, but we should fix this with a governance policy up front."
>
> - VIPER Program Management

Design the System for End Users

Design the system based on end-user needs; it should be easy to use so that technical and non-technical emergency responders can use it.

- Make the system easy to use.
  - Do not put too much information on the screen.
    - End users only want to see what is important to their role and for their decision making process.
- Tailor the system to the end-user needs.
- Ensure all information is accessible through a single interface.
  - This saves end-user time and does not require access to multiple databases.

> "The key is having overlays that meet my needs."
>
> - Virtual Alabama End User

- Make the system scalable.
  - Should support growth in number of end users.
- Ensure the tool is customizable by the end user to support their needs.

Use an Incremental Growth Model

Alabama and Virginia both found the development model of starting with a basic functionality, gaining buy-in, and then adding functionality to be successful. This model allows the project team to create a basic tool to share with potential end users more quickly. It also enables the project team to build functionality as end users see the system and identify new ways they can use the system to improve their mission.

- Start small and scale out.
- Add features incrementally.
- Add end users and agencies incrementally.

Participate in Existing Collaborative Communities or Create Your Own

In recent years, communities of end users, operators, and technical staff have come together to share their experiences, successes, lessons, and even programming code while implementing information-sharing solutions. Located across the Nation, these communities are working to bridge the information-sharing gap. vUSA is in the process of establishing a collaborative community to trade and share non-proprietary software code with program managers in other cities, regions, and states.

- Participate in information-sharing forums to learn about updates and troubleshooting tips.
- Provide a collaborative environment for users to share ideas and methods for using the system in their operations.
  - Users at the local level should create local-based communities to improve information sharing, share operating procedures, and learn how other agencies use the system during day-to-day and large scale incidents.

For additional information on vUSA, please e-mail virtualusa@dhs.gov or visit www.firstresponder.gov/VirtualUSA.

VIRTUAL USA™

Developed by the U.S. Department of Homeland Security's Science & Technology Directorate, in partnership with the response community, Virtual USA creates a cost-effective nationwide capability to significantly improve information sharing and decision making during emergencies and day-to-day operations.